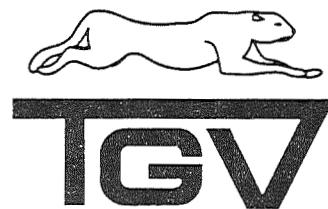


N91-27020

MultiNet TCP/IP
for
VAX/VMS
Update

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MultiNet TCP/IP for VAX/VMS Update

- Multi-protocol networking services (TCP/IP, CHAOSnet, PUP) for VAX/VMS computer systems
- Currently shipping ***MultiNet V2.2***
- Single kit for VMS V4.5 - V5.4
- All DEC supported VAX/VMS configurations

Device Support

Ethernet

- All Digital controllers
- CMC ENP family in link mode
- Exclan/Novell EXOS family (except BI board) in link mode
- Interlan NI1010
- Xerox 2.94 Mbps Ethernet

Other Technologies

- NSC Hyperchannel
- Shared Proteon proNET-10, 80
- X.25 - ACC 5250/6250
- T1/HDLC - ACC 5100/6100
- DMR-11, DMV-11 (IP over DDCMP)
- SLIP - using any VMS terminal line

DECnet Interoperability

- DECnet over IP; encapsulates DECnet datagrams in UDP datagrams (appears to DECnet as a point-to-point link between DMR-11 interfaces)
- IP over DECnet
 - Kernel implementation — transmits IP datagrams over a DECnet link in the networking kernel by calling NETDRIVER at the ALTSTART entry point
 - Dbridge
 - * Transmits IP datagrams over a DECnet link via a user process using \$QIO reads/writes
 - * Interoperable with WIN/TCP and Fusion Dbridge implementations

Installation

- VMSINSTAL - painless
 - 99% of configurations supported
 - 15 minutes or less on most newer systems
- Configuration utilities
 - Handle all aspects of network configuration and operation
 - Perform sanity checks to ensure viable configuration
 - Automatically generate all startup command files
 - Utilities:
 - Network/devices
 - Services
 - Remote printer queues
 - DECnet over IP
 - Client and Server NFS

MultiNet Services

- Although servers may listen on their own for service requests, the Master Server provides an easier way of invoking services
- Inbound connection requests handled by Master Server (configured by the server configuration utility)
- Accepts or rejects connection; if it accepts, it either:
 - Performs the service internally, or
 - Creates a server process and passes the connection on SYS\$INPUT, SYS\$OUTPUT, ...
- Can restrict access on source host or net address on a per-service basis
- Keep an audit trail of attempted, accepted, and rejected requests on a per-service basis
- Sites can provide locally written Auditing code
- Internal servers may be linked in or dynamically loaded from shareable images

Domain Name Server

- BIND 4.8.1 + Partial Asynchronous Zone Transfers
- Runs internal to Master Server
- NSLOOKUP provided
- If Domain Name System (DNS) query fails, or DNS not enabled, lookups use host tables compiled using a perfect hashing scheme

Routing Protocols

- GATED 1.9.1.7
- Runs internal to Master Server
- Supports RIP, EGP, HELLO

Telnet

- Direct connection between VMS terminal driver and network kernel
 - Overhead about the same as a DZ-11
 - No process involved, so no context switching
- Virtual terminals supported
- Negotiations
 - Terminal type (SMG)
 - Window size
 - Baud rate
 - Flow control (negotiated local by default)
 - TN3270 automatic recognition
- No inherent limit on number of incoming connections; customer running with 150 connections into a VAX 6230
- Optional switches to bypass newer option negotiation features for compatibility with other broken Telnet implementations (antique-mode)

FTP

- Hybrid server
 - Initially runs internal to Master Server
 - When USER and PASS are received, LOGINOUT is invoked to validate, initialize, and run the FTP server process
- Supports all VMS security features:
 - ACLs (not just UIC ACLs)
 - Accounting
 - Auditing
 - Breakin detection and evasion
 - Security alarms
- Runs SYLOGIN.COM, LOGIN.COM
- Creates FTP_SERVER.LOG file in login directory with log of transactions
- STRU O VMS
 - Transparent VMS-VMS transfer of all VMS file types
 - Automatically negotiated
 - Fast, no reformatting needed
- Record structure also supported
- Performance:
 - MicroVAX II can saturate DEC Ethernet interfaces

SMTP

- Uses VMS Mail foreign protocol interface:
 SMTP%"user@node"
- Enqueueing done with VMS server queue
 (using VMS queue management)
- MX support
- Tries all IP address found via "A" records
 until successful
- Incoming and outgoing mail enqueued
 (allows incoming mail to be forwarded
 to an unavailable DECnet node)
- MM-32 user interface bundled with
 MultiNet
- VMS Mail SET FORWARD and SET
 PERSONAL-NAME supported
- Supports outbound cluster (or
 organizational) alias
- PMDF supported as alternative (fully
 functional email gateway)

DECwindows over TCP/IP

- DECwindows over TCP/IP support provided by emulation of the VMS/ULTRIX Connection (UCX) \$QIO interface
- Looked into using DECwindows transport layer interface, but decided to do UCX \$QIO emulation as a more general solution (to support other applications written to run over UCX)

BSD "r" Services

- RLOGIN — remote terminal protocol
- RSHELL/RExec — remote command execution
- RCP — remote copy protocol
- RMT — remote access to VMS tape drives
- Each uses "r" services authentication
(HOSTS.EQUIV and .RHOSTS)

Remote Printing

- LPD protocol client and server
 - Integrated with VMS queueing system
 - UNIX machines can print on VMS printers
 - VMS systems can print on UNIX printers via a VMS print queue (symbiont and spooled pseudo-device)
- Stream-mode symbiont sends print jobs directly to remote TCP port (useful for printers connected to terminal servers)
- Controlled by printer configuration utility
- Supports VMS accounting
- User definable */etc/printcap* to VMS print queue attribute mapping

RPC Services and NFS Server

- Full UNIX filesystem semantics mapped to VMS filesystem
- Respects VMS diskquotas
- VMS text files are converted to UNIX stream format for access from NFS clients
- Cache to mask VMS bottlenecks
- Supports all ODS-2 VMS volumes:
 - Shadow sets
 - Bound volumes
 - DFS served disks
- Very high performance
 - Multi-threaded so performance not degraded by multiple clients
 - Runs in the kernel, so no process context overhead involved
 - Uses a special XDR serializer

NFS Client

- Transparent file access to NFS servers from VAX/VMS systems
- Emulates Files-11 ODS-2 XQP, presenting virtually all of the VMS file system semantics
- Supports arbitrary RMS file/record types with text files mapped to RMS Stream_LF record type
- Performance, even with majority of code in process for debugging, is good (within a factor of 3 of a local disk)

NETCONTROL

- Allows privileged users to control servers running internal to the Master Server
- Can be used to control both local and remote machines (using ***MultiNet*** security features)
- MULTINET NETCONTROL /HOST=TGV.COM
NFS RESTART

Diagnostics

- PING – uses ICMP packets to determine reachability, packet loss, round trip timing
- TRACEROUTE – trace route of a host through an IP network
- TCPPDUMP – Ethernet protocol analysis

Programming Support

- Shareable 4.3BSD UNIX compatible socket library
- Programmer's kit separately installed (MNETLIB)
- Hardcopy Programmer's Guide and extensive online HELP information
- MultiNet \$QIO (compatible with WIN/TCP), EXOS compatible \$QIO, and UCX compatible \$QIO interfaces supported
- RPC programming library

Miscellaneous Features

- FINGER
- WHOIS client
- NETSTAT
- SYSTAT
- TFTP
- BOOTP
- RARP
- NTP
- TALK/NTALK
- BBOARD
- RUSERS
- RWALL
- REMIND
- CHARGEN
- DAYTIME
- TIME
- DISCARD
- ECHO
- RPCQUOTA

MultiNet Futures

- Kerberos
 - ticket server
 - kinit
 - Kerberized Telnet and FTP
 - klist
 - kdestroy
- ALL-IN-1/Message Router to SMTP gateway capability
- VMS NFS Client to VMS NFS Server support
- Performance enhancements in NFS Client and Server

***MultiNet* Futures**

- Support for booting diskless Sun workstations and DECstations
- Full support for VAX-11 C runtime socket library (run UCX applications unmodified over ***MultiNet***)
- GATED V2.0 - EGP, RIP, HELLO, BGP
- BIND 4.8.3
- POP2 Mail Server (possibly more)

MultiNet Futures

- `select()` supported in ***MultiNet*** socket library
- ISODE — OSI applications over TCP/IP
- XVIEW toolkit and OPEN LOOK Window Manager under VAX/VMS and DECwindows
- SNMP network management station under VAX/VMS
- Command line recall and editing !!!